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[54] PROCEDURE FOR CONTROLLING THE OPERATION OF A DRIVE-THROUGH CHAMBER TYPE TIMBER DRYING KILN

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[56] **References Cited:**

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[57] **ABSTRACT**

The timber loads (P) to be dried are introduced on a roller track (10) through a front door (11) in a drying channel. After the drying process, the timber loads (P) are removed from the opposite side of the drying kiln through a back door (13). The drying kiln comprises two or more independently operating drying chambers (K1, K2, K3) connected in series so that when the timber loads are moved from a preceding chamber (K1; K2) to the next chamber (K2; K3) the drying process is continued in said chamber (K2; K3) from the point in the drying schedule which has been reached in the preceding chamber (K1, K2). The operation of the series-connected group of drying kiln channels (K1, K2, K3) is controlled by a control system having as many control units (S1, S2, S3) as there are drying kiln chambers in the group of drying kiln chambers. After in a given control unit (S1; S2; S3) has been set a drying schedule (Fig. 3) proper for the particular timber load (P) to be dried, the control signal (a1; a2; a3) of the control unit (S1; S2; S3) is disposed to follow along with the timber load (P) being dried and to be connected always to control the control means (23, 26) of that drying chamber in which the

package (P) being dried resides at any given moment.

DETAILS

Procedure for controlling the operation of a drive-through chamber type timber drying kiln The present invention concerns a procedure for controlling the operation of a drive-through chamber type timber drying kiln in which the timber loads to be dried are conveyed-on a roller track or equivalent through a front door into a drying channel and from which the timber loads are after drying removed on the opposite side of the drying kiln through a back door, and in which two or more independently operating drying chambers have been connected in series so that when the timber loads are transferred from a preceding chamber to the next chamber, the drying process is continued in this chamber substantially onward from that point in the drying schedule which was reached in the preceding chamber.

So-called drive-through chamber type drying kilns are known in prior art. The structure of these is such that drying kiln loads assembled of drying kiln packages are conveyed into a drying chamber on a roller track in front of them, whence the loads are pushed into the drying kiln chamber. The dried loads are taken out through the opposite door of the drying kiln chamber. These chamber-type drying kilns of prior art have the advantage that in them the load-changing time is relatively short. A drawback is, however, the expensive implementation of such drying kilns, because they require two opposed doors and roller tracks on both sides of the drying kiln chamber.

In the same applicant's Finnish patent application No. 831331 (filing date April 19, 1983) is disclosed a drive-through chamber type timber drying kiln, which was the starting point for the present invention.

The object of the invention is to develop further the chamber-type drying kiln described in said Finnish patent application. Arrangements for controlling the operation of the chamber-type drying kiln disclosed in said Finnish patent application have proved complicated and problematic. As known in prior art, each drying kiln chamber has had a control unit of its own, controlling the operation of the chamber, 4 'k 1 4 14.4 11 U.3 during the drying process in the case of each timber load introduced in each chamber. This control arrangement known in the art involves the drawback that when the load to be dried is moved from one chamber to another the controller of this chamber must be re-programmed every time to conform to the drying schedule of each incoming load. This causes great need of programming, and/or the procedure leads to complicated and expensive control means.

The object of the present invention is to avoid the drawbacks mentioned and to produce a new and a more advantageous control system in drive- through chamber type drying kilns.

For achieving these aims and those to be disclosed later on, the invention is mainly characterized in that to control the operation of-a group of drying kiln channels connected mutually in series has been provided a control system having as many control units as there are drying kiln chambers in said drying kiln chamber assembly, and that after a given control unit has been supplied with the drying schedule proper for the new timber load to be dried, the control signal of said control unit is disposed to follow along with said timber load to be dried and to become connected in each instance to the controls or equivalent of that drying chamber in which the particular package to be dcied resides at each moment.

In the following, the invention is described in detail with reference being made to certain embodiments of the invention presented in the figures of the attached drawing, to the details of which the invention is in no way narrowly confined.

Fig. I presents in a schematical drawing, a drive-through chamber type drying kiln and the control

system according to the invention controlling its operation.

Fig. 2 shows the principle of the programme cycle selector switch belonging to the control system of the invention.

Fig. 3 presents a principle example of a possible drying schedule to be followed in the drying kiln of the invention.

As shown in Fig. 1, the chamber-type drying kiln comprises three series- connected drive-tbrough chamber-type drying kilns K1,K 2 and K 3* In practice there may be a plurality of drying channel groups formed in this way, in parallel arrangement. The chamber group K13 K 2 and K 3 has a common front door 11, wherethrough the timber loads P to be dried are introduced (arrow P in). The dried timber loads are taken out through the back door 14 (arrow P out). The timber loads Ply P 2 and P 3 pass through the drying chambers Ki., K 2 and K 3 on their carts 15, the wheels 16 of which move on tracks 10 passing through the group of chambers. Between the drying chambers are placed movable partitions 12 and 13, which may be of rather low-weight construction.

In Fig. 1 are schematically shown the air circulation means by which the drying air is circulated in each chamber K through the timber package P to be dried, the temperature and/or humidity of this air being controlled by a control system according to the invention connected to the drying kiln. The said means for circulating the drying air have been quite schematically depicted in Fig. I and regarding a more detailed embodiment example reference is made to the Finnish patent application No. 831331 by the same applicant. On one side of and/or above each drying chamber K is disposed an air circulation duct 17, defined, as shown in Fig. 1, by a partition 18 and an upper wall 19. In the ducts 17 is disposed a blower 20, on the suction side of which intake air ducts 21 open into the channels 17 and through which fresh air (arrow F in) is drawn to the drying air circulation. To the channels 17 are connected exhaust air ducts, not depicted. In the channels 17 are disposed drying air heating radiators 25, the volumetric flow and/or temperature of the heating fluid circulating in them being controlled with a control valve 24.

The position of the control dampers 22 in the intake air ducts 21 is controlled by control motors 23. Similarly, the position of the control valve 24 of the heating radiator 25 is controlled with control motors 26. Each drying chamber K,,K, and K, is provided with control means of its own for the intake air and drying air heating radiator 25.

In the following is described the control system controlling the operation of the chamber-type drying kiln according to the invention depicted in Fig. 1, said control system comprising three separate control centres S1.,S 2 and S 3* The control centres S provide, in accordance with a programme entered in them in each instance in a manner known in itself in the art, a control signal al,a 2 and a 3' Said control signals al,a 2 and a 3 are connected to a programme cycle selector switch means 30 which directs the control signals aila 2 and a 3 each in turn to control the operation of the control motors 23,26 of the different chambers K1.,K 2 and K 3 of the drying kiln.

The control system may, if required, include meLsuring means and feedback means, by which for instance the state of the drying air circulating in the different drying chambers K1,K 2' K 3 is monitored and the control signals a I,- a 2 and a 3 are accordingly influenced.

In special instances, the control signals a,,a 22 a 3 may also be formed according to the "blind control" principle, in which case said measuring means and feedback arrangements are not needed.

In the following is described, with reference to Figs. 1,2 and 3, the operation of the drying kiln of the

invention and of its control svstem. When the quality, that is, the dimensions and possibly the moisture content, of the timber package P 1 entering the first chamber is known, a drying schedule is entered in the control centre S 1 in a manner known in itself in the art, and this schedule is for the part of the package P I adhered to all through the drying kiln channel K 1 -K 3* In Fig. 3 is depicted one conceivable example of the drying schedule. Let us follow with the aid of Fig. 3 the progress of drying of a green package P I introduced in the chamber K 1* In Fig. 3, the straight line K represents the dry temperature t k of the drying air and the straight line M, the equivalent wet temperature t M. The horizontal axis T is the drying time and the vertical axis t, said drying air temperatures t k and t m in OC. With the aid of the control signal a 1 from the control centre Si., which in the first phase of operation is directed to act on the control motors 23 and 26 of the first chamber Ki. and following the drying schedules K and M, drying is accomplished during the time interval 0-T1, from the dry temperature t A to the temperature t lk and from the wet temperature t om to the wet temperature t 1m* Thereafter, the package P 1 is moved into the next chamber K 2.

As taught by the present invention, at the same time as the transfer of the package P 1 from the first. drying chamber K 1 to the second drying chamber K 2 takes place, the switch 31 of the selector means 30 is turned, or automatically caused to turn, so that the control signal a 1 now goes along with the timber package Pi. that is, the control signal a 1 coming from the first control centre S 1 begins to control the operation of the second chamber K 2 with the aid of its control motors 23 and 26. It is thus understood that the drying process is continued following the drying schedules K and M in the second chamber K 2 as if no transfer had taken place regarding drying schedule and directing of the control means. However, the timber package P 1 has been moved from the first chamber K I to the second chamber K 2 and a new package has been introduced in the first chamber Ki. and the control of this latter package's drying process is taken up, as shown in Fig. 2, by the control centre SV which has just been released from controlling the drying of the package P 3 removed from the last chamber K 31 the drying schedule implied by the new package having been programmed in the control centre S 3' In the second chamber 1K 2 the drying process is carried out, as shown in Fig. 3, during the interval T 2-T I to the dry temperature t 2k and the wet temperature t 2m' whereafter the package is moved to the next drying chamber K 3 and at the same time the selector switch 31 is stepped to its next position, in which the control signal a I of the control centre S 1 is directed to act on the control motors 23 and 26 of the third chamber K 3.

In the last chamber K 3-1 drying of the same package is carried out during the interval T 3-T 2 to the ultimate dry temperature t 3k and wet temnerature t under control by the same control centre S, under the control of which the drying process was commenced in the first chamber K I and carried out also in the second chamber K 2 Thereafter, said package is removed through the back door 14, and the control centre S I becomes free to control the drying of the next timber package, and the drying schedule for this new package is programmed therein, and its control signal a 1 is directed over-the selector switch 31 to act on the first drying chamber K 1* In the drying kilns in actual practice there are as a rule several drying kiln chamber groups K1-KN connected parallel. Each drying kiln chamber group Kl-% then has its own control system with as many (N) independently acting control units S I-S N as there are consecutive drying kiln chambers connected in series in the drying kiln chamber group controlled by it.

By the invention is implemented in practice the very important advantage that, for each timber package to be dried, it is necessary to carry out only one programming of the control centre because the control centre "accompanies" the package being dried to all those chambers through which the package passes during the drying process.

In the following are stated the claims, within the inventive idea defined by which various details of the invention may vary.

CLAIMS (ENGLISH)

CLAIMS

1. A procedure for controlling the operation of a drive-through chambertype timber drying kiln in which the-timber packages (P) to be dried are introduced on a roller track (10) or equivalent through a front door in a drying channel, and from which the timber packages (P) after drying are removed through a back door (13) on the opposite side of the drying kiln, and in which two or more independently operating drying chambers (K1J.K 2-1 K 3) are connected in series so that when the timber packages are moved from a preceding chamber (K I;K 2) to the next chamber (K 2;K 3) the drying process is continued in this chamber (K 2;K 3) substantially onward from the point of the drying sc hedule that was reached in the drying process in the preceding chamber (K I;K 2), characterized in that to control the operation of a group of drying kiln channels (K15K 2-1 K 3) connected in series has been disposed a control system with as many control units (SI.S 2-1 S 3) as there*are drying kiln chambers in said group of drying kiln chambers, and that after setting in a given control unit (S I;S 2;S 3) the drying schedule proper for each timber load to be dried (Fig. 3), the control signal (a 1;a 2;a 3) from said control unit (S I;S2;S3) has been arranged to follow along with said timber load (P) being dried and to become switched to control always the control means (23,26) of that drying chamber in which said package (P) being dried resides at any given moment.

2. Procedure according to claim 1, characterized in that the control signals (al,a 2" a 3) derived from the different control units (Sl,,s 2j S 3) are connected to a selector means (30) which directs said control signal sequentially to the control means (23,26) or equivalent of that drying chamber (K) in which the timber package (P) to be followed resides. 3. Procedure according to claim I or 2, characterized in that with the control signals (a a a) derived from the control units (SVIS 29 S 3) are sequentially controlled the control means (23) of the control damper (22) of the intake air (F in) of each drying chamber (K1,K K) and the control motor (26) of the control valve 2-1 3 (24) of the-heating radiator (25) for the drying air, and possibly other equivalent means affecting the operation of the chamber.

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